NA Review of the NIOSH Construction Research Program:

Reduction of Musculoskeletal Disorders through Participatory Ergonomics

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Objective

- To evaluate whether a implementation of a participatory ergonomics (***PE***) model can
  - Reduce the incidence, severity and cost of musculoskeletal disorders in construction,
  - Identify major prerequisites for implementation of the model, and
  - Help define the steps that need to be taken for wider dissemination of this model

Approach: Essential Elements of PE

- A programmatic approach builds company/union specific capability
- This knowledge is used to identify risks and implement specific interventions
- Ergonomics problems are continuously identified and solved on the job site

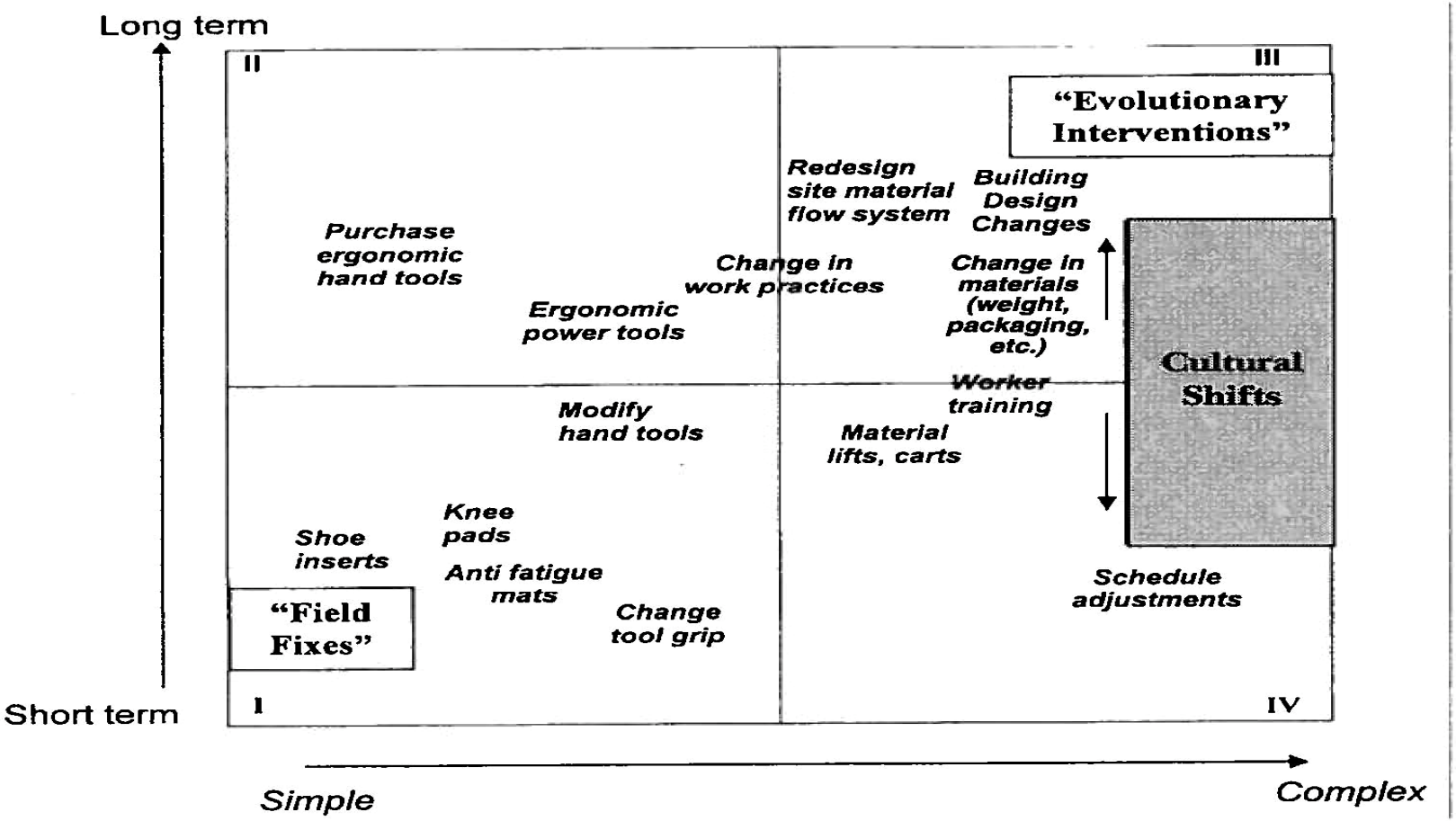
Rationale

- PE reduces WMSD risk factors in other industries
- A program approach is needed in construction because the industry has countless tasks with significant physical hazards
- We expect that PE should work in construction - common use of problem solving and improvisation in the construction process

Evolution of PE in this project

- **Problem identification**. Ergonomist identified significant physical stresses in job tasks, used "field fixes" where able
- **Resistance to change.** Often told that a problem can't be fixed because that particular task, tools or material was specified by design.
- **Overcoming resistance.** The ergonomist demonstrated alternative approach(es) and impact
- **Result.** Management established safety-in-design initiative

Locus Of Control Model



Project Design and Methods

Construction researchers adapted model from general industry with:

- Discussions with industry experts: owners, managers, and workers.
- Multiple ergonomic job analyses
- Design of task-specific interventions for common tasks with known risks
- Extensive training activities

Intervention: Model was applied at construction of a new semiconductor facility

- Ergonomic training for all workers
- Ergonomics curriculum specifically for supervisors/ health and safety staff
- Ergonomist on site 10 hours/week to address worker/supervisor problems.

Evaluation

- Impact measured with workers comp claims data
- Data for intervention project compared to two other similar projects

Comparison of intervention and non-intervention projects

- Comparison of 3 large projects (one intervention/two controls):
  - Owner Controlled Insurance Program
  - Same CM/GC firm
  - Same type of construction
  - New construction of semi-conductor production plants
  - Peak employment over 2200 workers/project
  - Different locations (Oregon, Arizona, New Mexico)

The 3 New Factories

Fab	Total Area (Sq feet)	Total Cost	Schedule	Peak Employment
A	566, 500 SF	$600 M	12 months	2470
B	773,223 SF	$705 M	14 months	2430
C	1,298,945 SF	$663 M	12 months	2150

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Project Locations

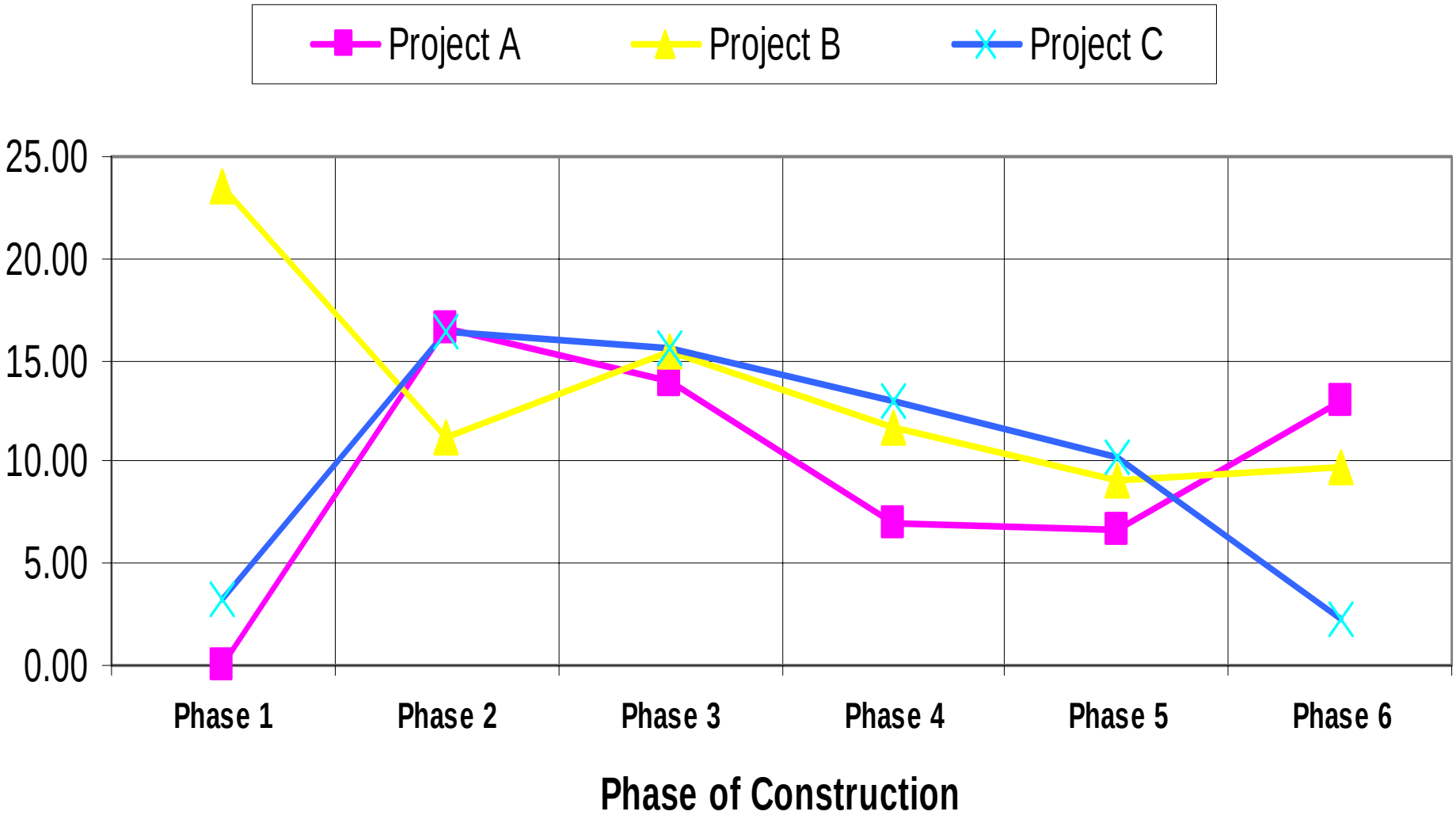
- Project A + B (Controls): Arizona + New Mexico
- Medical/indemnity costs unlikely to explain effect:
  - Arizona has had lowest WC costs in US
  - In 2002 ranking of WC premium costs: Arizona at 46th, Oregon ranked 44nd, NM at 43rd

◆Rousmaniere P, March 2003 issue of *Risk and Insurance*

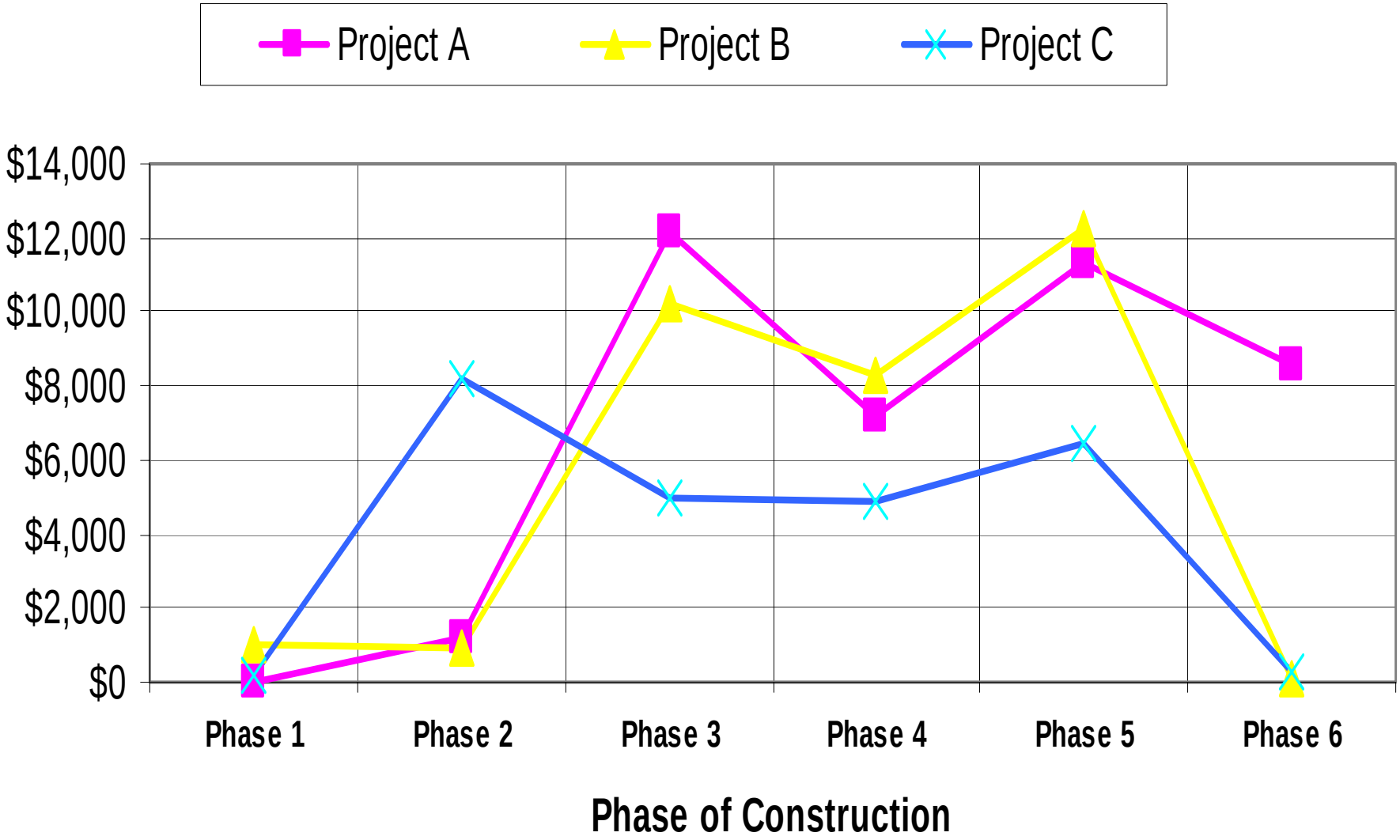
Distribution of Claims for Three Projects
(N = 1560 injuries)

	All injuries	OSHA Record	First aid	Normal cost	High cost
Sprain/ strain	40%	25%	38%	39%	63%
Laceration	22%	54%	24%	21%	9%
Contusion	18%	2%	19%	17%	16%
Foreign body	9%	3%	8%	13%	0%
Other *	11%	15%	12%	10%	11%

Claims Rate by Project and Phase



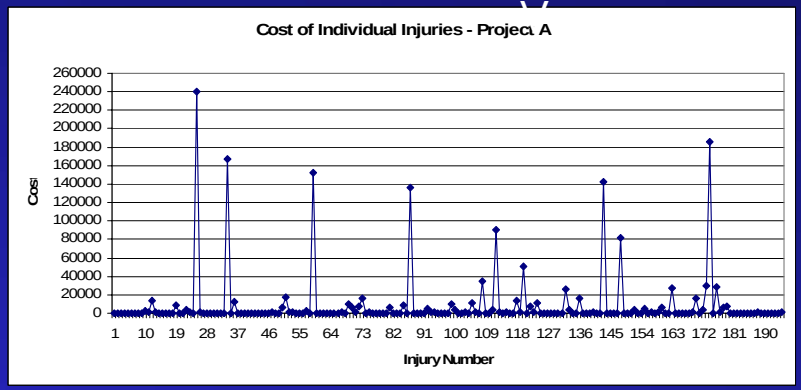
Average Cost per Injury by Project and Phase



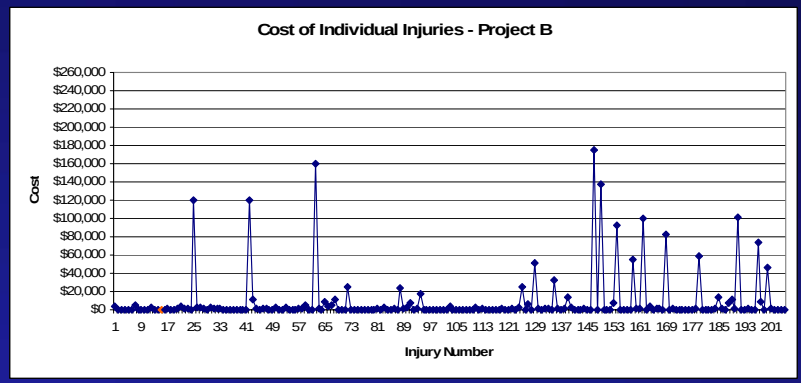
Claims Distribution by Cost and Project

(excluding first aid only cases)

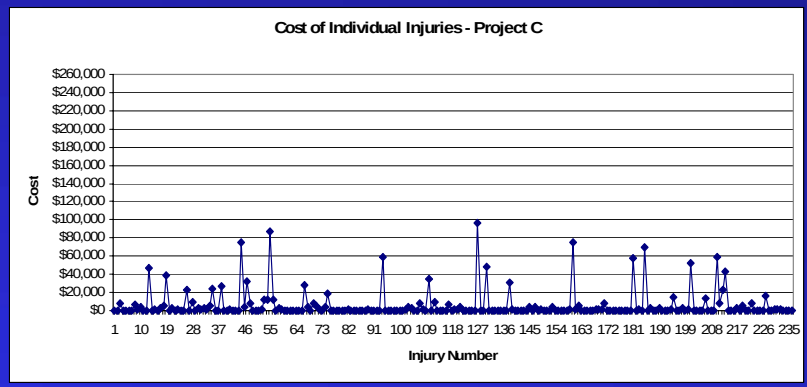
A – comparison



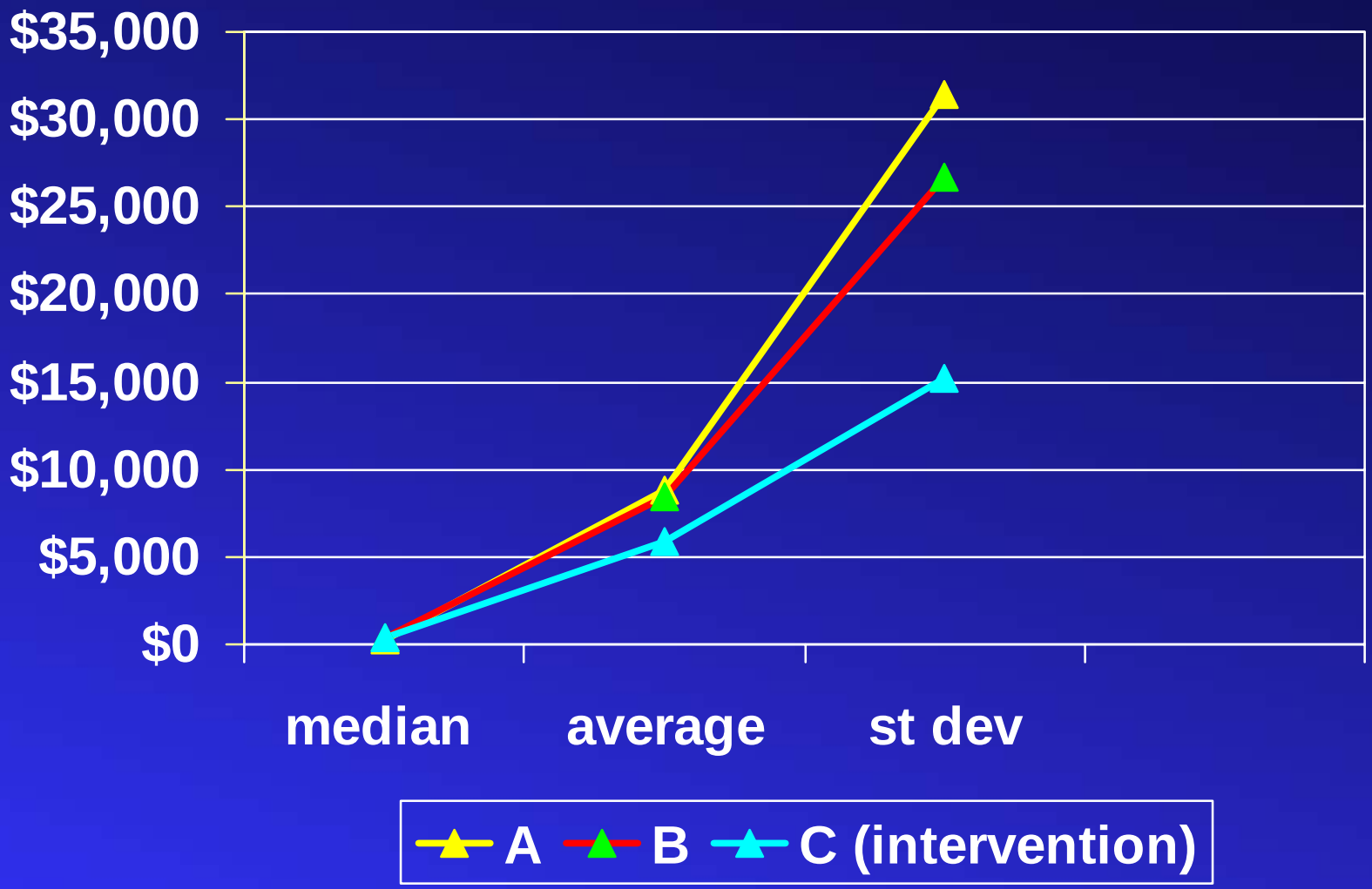
B - comparison



C - intervention



Final Project Outcome: Injury costs at 3 new factories



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Outputs and Transfers

- Hecker S, Gambatese J [2003]. Safety in Design: A Proactive Approach to Construction Worker Safety and Health. AOEH *18*(5):339 342
- Weinstein M, Gambatese J, Hecker S [2005]. Can Design Improve Construction Safety?: Assessing the Impact of a Collaborative Safety-in-Design Process. J Constr Engrg Mgmt *131*(10):1125 1134
- 15 presentations to professionals and industry
- Design for Safety conference 2003

Intermediate Outcomes

Construction owner committed to using the ergonomics/safety-in-design model in 12 future fab construction projects

Construction owner identified essential program elements

Essential Program Elements for PE

Knowledge and experience needed at *all* levels: owner, general contractor, subcontractors, workers

Evidence Base: Systematic approach ***and*** available innovations/solutions need to be effective

Comprehensive approach: Reduction of WMSDs occurs on the local project and requires ***both***

- Observation/identification of risks/hazards
- Intervention to reduce risk/eliminate hazard

External Factors

Lessons Learned: Dissemination of Model

Necessary knowledge and experience among owner, general contractor, subcontractors, and workers are not readily transferred to other geographic areas

Way Forward

- **Additional demonstration projects can measure key elements of LCS, to promote widespread use**
- **There is a need for more industry-wide programs**
- **Those that exist need more evidence-based programs and support**

Goal 3: Reduce the major risks associated with musculoskeletal disorders in construction

- 3.1: Disorders associated with awkward postures, lifting and carrying, and stressful hand-wrist conditions
- 3.2: Disorders associated with excessive exposure to vibration